PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit: 1742 :
Examiner: Alexander, M.

In re application of : Title: Eglin Steel – A Low Alloy High Strength Composition

M. Dilmore et al.

Serial No. 10/761,472

Filed January 21, 2004 : Attorney Docket 040650

DECLARATION OF JOHN PAULES
UNDER 37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, John R. Paules, depose and say as follows:

1. I am employed as General Manager of Ellwood Materials Technologies, a subsidiary of Ellwood Group, Inc., the parent of Ellwood National Forge, Co., the present owner of the patent application referenced above (the "present application").

2. I earned B.S. and M.Eng.degrees in Metallurgy and Materials Science from Lehigh University in 1976 and 1981, respectively, and have worked in the field of steel metallurgy for 30 years. I am a registered Professional Engineer in the Commonwealth of Pennsylvania. I have worked with Eglin Steel, the low alloy steel described in the present application, for nine years. In particular, I am responsible for development of melting, forging, and heat treatment practices which result in mechanical properties and service performance which meet requirements. I have directed research studies of the fine scale microstructure of Eglin Steel to gain a full understanding of the effect of fine precipitate particles on properties such as strength and toughness. I have published and presented a technical paper on the development and properties of Eglin Steel.

3. On information and belief, the U.S. Patent Office issued an Office Action dated October 16, 2006, rejecting the claims of the present application based on the information disclosed in the following patent publications (the "Referenced Patents"):

U.S Patent No. 3,574,602 to Gondo;

U.S. Patent No. 3,068,095 to Anthony;

U.S. Patent No. Re. 28,523 to Hill.

4. I have reviewed the present application, the October 16, 2006 Office Action and the Referenced Patents. Based on my experience in metallurgy and with high strength alloy steels in particular, it is my opinion that the comparison between Eglin Steel and the materials described in the Referenced Patents is misplaced.

5. In the Office Action, the Examiner stated, with respect to the Anthony patent, that "the alloy steel of Anthony would inherently have the claimed tensile strength because Anthony teaches (examples) comparable strengths and teaches substantially the same composition as that of the claimed invention. Furthermore, the alloy steel of Anthony would inherently have a Charpy V-notch impact strength of about 20-43 at -40 degrees F because Anthony teaches (examples) comparable high strength and ductility and teaches substantially the same composition as that of the claimed invention."

6. Attached hereto are three graphs that compare carbon content to tensile strength, hardness and ductility and compare impact values and tensile strength for certain alloys. Figures 18.15 and 18.16 are from "Steels—Processing, Structure, and Performance", by G. Krauss, ASM International, 2005, and Figure 8.17 is from a paper published in the Journal of the Iron and Steel Institute, Volume 194, 1960, by Irving and Pickering. Although ultimate tensile strength is fairly predictable based on carbon content alone, ductility and toughness are more complex and are influenced by additional factors. Although the graphs are based on specific alloys not entirely comparable to the alloys of the Referenced Patents, the graphs are relevant to this analysis because the trends in the graphs demonstrate that as carbon content increases, the ultimate tensile strength increases (Fig. 18.5) and % Elongation decreases (Fig. 18.16). The graph of Fig. 8.17(b) demonstrates that, for a variety of alloy combinations, impact values (Charpy toughness) decrease as tensile strengths increase.

7. The assumption made by the Examiner is neither supported by the disclosure in the Anthony patent nor the experience among metallurgists regarding the relationship between ultimate tensile strength and impact strength. Ductility (% Elongation) and impact toughness (Charpy energies) are known to be inversely related to ultimate tensile strength. At the relatively high carbon range disclosed by Anthony (0.35-0.45% in col. 1 and 0.47% in col. 3) and as evidenced by the low Elongation results reported by Anthony, the lightly tempered microstructure that would be obtained by the Anthony alloy steel will have poor toughness and ductility relative to those of the Eglin Steel of the present application.

8. The Anthony patent reports Elongation values of 4.0% to 7.5%. The present application reports the same tests as strain to failure (HR STF) in column 3 of Table 3 ranging from 15.1 to 16.6%. Elongation as used in Anthony is % Elongation to fracture, a measure of ductility determined by the degree of elastic and plastic deformation the alloy will endure until it fractures. Elongation to fracture is another term for strain to failure. Therefore: the Anthony patent cannot achieve the elongation values required for the end application of Eglin Steel.

9. In the Office Action, the Examiner stated that "the steel of Gondo would inherently have a Charpy V-notch impact strength of about 20-43 at –40 degrees F because Gondo teaches (col. 1 lines 14-24) comparable high tensile strength and toughness and teaches substantially the same composition as that of the claimed invention." The Gondo patent describes alloys having tensile strengths from 130-159 kg/mm^2 (See the Table at col. 4), which is equivalent to about 185 – 222 ksi. The claimed alloy of the present application has much higher ultimate tensile strengths, reported to be between about 247.5 and 291.9 ksi in Table 3 of the present application. The Charpy impact strength properties would not be expected to be comparable to those found for Eglin Steel. Therefore: the Gondo patent would be incapable of performing the tasks for which Eglin Steel was invented.

10. Notwithstanding overlap in the ranges of some elements, Eglin Steel contains a combination of elements in amounts that are not the same as, and do not overlap in all respects, the combination and amounts of elements shown in the Referenced Patents. It is believed that the unique combination of elements in the amounts disclosed and claimed in the present application together with the heat treatment used with Eglin Steel produces a unique and unexpected combination of mechanical properties which are significantly different than those in the Referenced Patents. None of the Referenced Patents describe the combination of low levels

of Carbon, high levels of Silicon and high levels of Tungsten to produce a low alloy steel having the high strength, high toughness, high hardness and high ductility properties of Eglin Steel. Moreover, Eglin Steel can be made at a lower cost than the alloy disclosed in the Hill patent, for example, because of the elimination of expensive cobalt as part of the alloy.

11. I further declare that all statements made herein are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any registration resulting therefrom.

John R. Paules

1/12/2007

Date

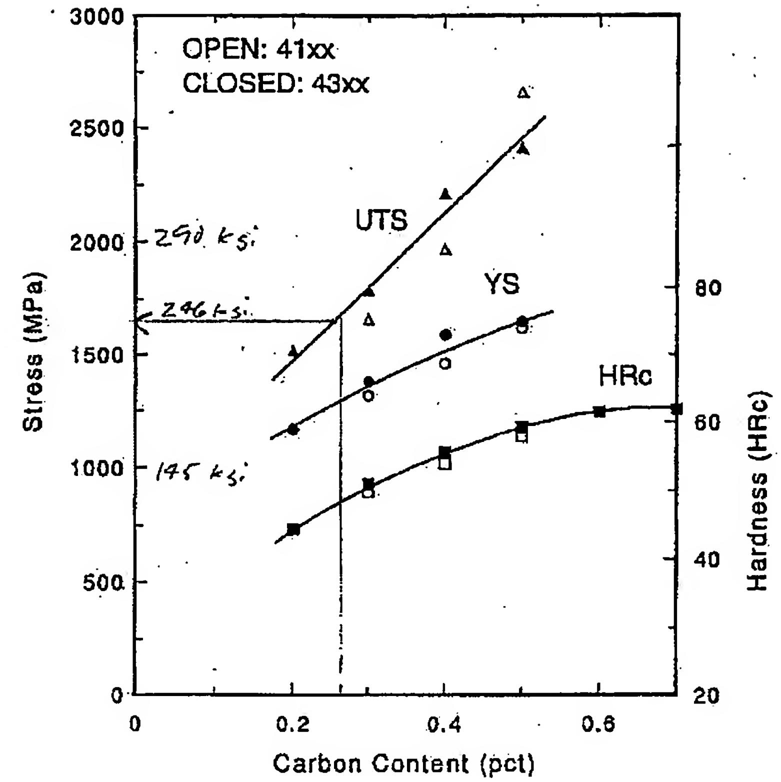


Fig. 18.15 Strength properties as a function of carbon content of 41xx and 43xx steels quenched to martensite and tempered at 150 °C (300 °F) for 1 h

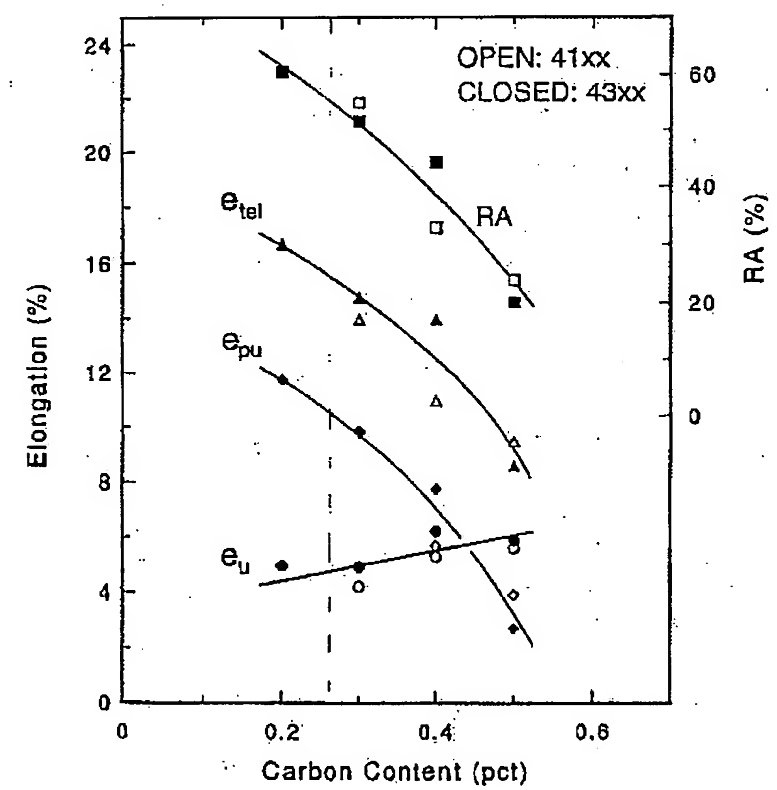
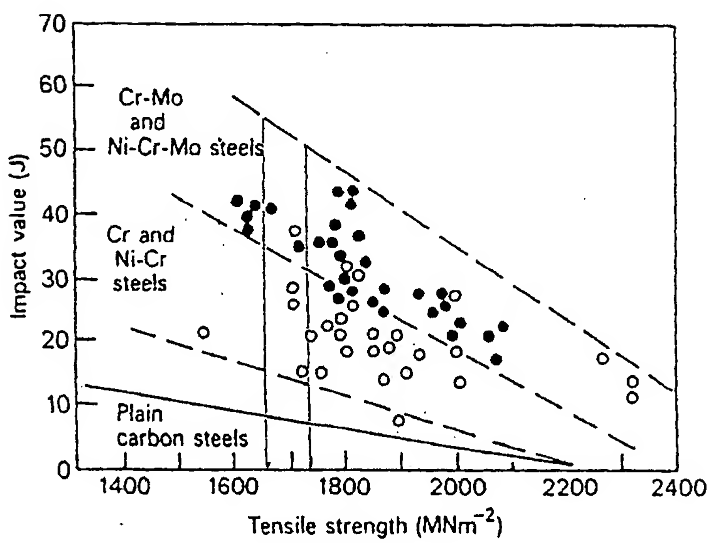


Fig. 18.16 Ductility properties as a function of carbon content of 41xx and 43xx steels quenched to martensite and tempered at 150 °C (300 °F) for 1 h



(b)

Fig. 8.17 Comparison of mechanical properties of plain carbon and alloy steels tempered at 200°C (Irving and Pickering, *JISI*, 1960, **194**, 137): a, effect of C on tensile strength; b, relation between tensile strength and impact value. Note beneficial effect of Mo.